DRIVERS AND BARRIERS TO CROSS-BORDER GAS TRADE IN THE SOUTHERN CONE

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Introduction

Following the presidential elections in Brazil and Argentina, the question of regional economic integration has returned to the political agenda. With the rapid expansion of regional trade in the 1990´s, it has become clear that the lack of infrastructure is a serious obstacle to the creation of integrated regional markets. Transportation, telecommunications and energy infrastructure affect the entire range of economic activities and are fundamental to promoting economic convergence. The lack of an integrated transportation infrastructure, for example, obstructs cross-border trade and impedes price convergence.

Among the energy industries, the natural gas industry (NGI) has the most potential for regional integration in South America, especially in the Southern Cone. The existing regional transmission infrastructure for natural gas is significant and gas reserves in the region are abundant and unevenly distributed. In addition, there are large potential markets in the region to be developed.

The context in which the region's energy markets find themselves today, with serious public financing restrictions and limited credit from multilateral institutions, is also conducive to greater gas market integration. Gas-based power generation, which presents lower construction costs than hydropower generation, is one of the keys to expanding power supply in the region and it seems a suitable option given the financial restrictions the region faces today. Given the abundance of gas resources, regional economic synergies will increase as a result of the convergence of the gas and electricity industries. Currently, the NGI is dominated by global players, whose business strategies focus on exploiting these types of synergies. These firms are capable of leveraging their investments on a large enough scale to integrate their activities regionally.

In addition to the factors favoring regional integration, there also exist important barriers to regional trade in the Southern Cone. Though reserves are sufficient to meet projected demand, industry will have to invest heavily to take advantage of these reserves and expand the transmission and distribution infrastructure in countries where the gas industry is just getting off the ground (Brazil, Bolivia, Uruguay, Paraguay). Argentina is the only mature gas market in the region. In order to attract private investment to foster regional integration, governments must mitigate the existing regulatory and structural obstacles to market integration.

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This paper analyses the main drivers and barriers for the regional gas trade. The first section considers the economic and technological specificities of the NGI, as well as the peculiarities of the macroeconomic context of the region. The second section analyses the main drivers for the gas trade in the region. The third section analyses the main obstacles for deepening gas integration. Finally, section 4 points out the role of companies and government in finding institutional and contractual innovations in order to overcome these obstacles.

1. International Trade and the specificities of the NGI

The NGI presents important idiosyncrasies relative to other energy industries. One of the most important is the high elasticity of gas demand. (Curien, 2000). Due to the lack of adequate transportation technology, widespread natural gas consumption is a fairly recent phenomenon. This forces the fuel to compete with other energy resources already in place, making it difficult for natural gas to develop exclusive markets. For this reason, gas prices are indexed to the price of substitute fuels. A price policy for natural gas cannot ignore the fuel´s market value, otherwise gas demand is threatened by inter-fuel competition.

Price elasticity is more intense when natural gas is in its infant phase. New gas consumers are very reactive to gas prices since the adoption of this energy sources frequently implies investments in equipment conversion or new equipment. Therefore, the rapid development of gas markets requires low gas prices relative to other fuels.

The gas transport and distribution network presents very specific technological characteristics as compared to the electricity grid. Gas flows are easier to identify and control. Unlike electricity, furthermore, natural gas can be stored (albeit at significant cost), making inter-temporal arbitrage a viable option in the market. Gas, finally, offers greater flexibility in the management of safety aspects of the network. These qualities link contractual and physical flows of gas and facilitates the coordination of the transactions in the gas industry (Newberry, 1999).

Though coordination of natural gas flows is than flows of electricity, the NGI faces important transaction costs due to the presence of specific assets and natural monopolies. Although alternative transportation technologies such as liquefied natural gas and compressed natural gas exist, gas pipelines are in most cases the most economic alternative. Therefore, the presence of natural monopolies[3] is an important feature of this transportation technology. Nevertheless, the market power of transportation companies is constrained by inter-fuel competition (Newberry, 1999). Given these characteristics, a change in the price of alternative fuels implies in a change in the margins of the players involved in the gas chain. This point represents one of the most important differences between the traditional pattern of development of the gas industry until the late 1980s and the current situation. After the liberalization of the energy markets, the price of the energy resources that compete with natural gas has become more volatile. Before the liberalization process, the government usually controlled natural gas, electricity and liquid fuels prices. Within this context, the market risks for natural gas were less intense.

In the infant phase of the gas industry, the small number of buyers and sellers increase the interdependence between them. In this context, opportunistic behaviour from one of the players

[3] Roughly, a natural monopoly can be defined as the situation when the least cost is achieved when the product is supplied by only one producer.

has negative economic impacts throughout the gas chain. In order to avoid higher transaction costs, the NGI has traditionally adopted vertical integration or long-term contracts as the main governance structure for investments (Estrada et. al., 1995).

Long-term contracts in the gas sector must have specific features in order to allow the management of the uncertainties related to changes in the gas rent:

a) Clear principles for price definition (cost-plus or netback);

b) Clauses for periodic renegotiations. Market situation can change rapidly.

c) Specific clauses for managing the volume risk (take-or-pay and ship-or-pay clauses)

The technological specificities mentioned above translate into specific economic risks, as far as international trade is concerned. The risk of opportunism is even more important for international transactions and the difficulties to find appropriate governance structure increases. Uncertainties are more important in cross-border gas projects, since the number of parameters that can change are higher. The regulatory risk, for example, is twice as large in cross-border projects, since two regulatory systems, rather than one, are involved in the transaction. Changes in the regulatory framework of one of the involved countries can affect the equilibrium of long-term contracts. It is also important to consider the political risk, which is also twice as large. The “exaggerated economic risks”, i.e. those that determined ex-ante, are also very important (exchange rate variation, strong variation in oil price, economic recessions, economic depressions etc). These economic risks result in higher transaction costs and longer contract negotiation periods.

The barriers mentioned above are more intense in the case of the Southern Cone, due to the economic specificities of the region. We emphasize three of these barriers: i) liberalization of end prices of fuels that competes with natural gas and electricity; ii) strong exchange rate volatility; iii) asymmetry in national regulatory frameworks and energy policy. These problems results in a high probability of financial unbalances for holders of long-term contracts that anchor the cross-border gas trade in the region.

An appropriate regulatory framework is very important to reduce the risks of cross-border gas projects. An appropriate regulatory framework means not only the reduction of regulatory asymmetries between gas markets in the region, but also a stable, coherent and transparent regulatory framework in each of the gas markets. High regulatory risks in one of the countries mean high risk for a cross-border project as a whole. Given the fact that cross-border gas sellers and buyers are very dependent on each other, these agents need to have confidence in the market environment before signing long-term contracts. Therefore, stability and sustainability of the market rules on both sides of the border are essential.

Contractual and regulatory difficulties aside, there are also factors that increase players’ interest in cross-border gas trade. Since natural gas is a non-renewable energy resource with a very asymmetric distribution and the possibility of pure economic rent (Chevalier, 1998), cross-subsides in the gas chain can be used to leverage projects. Therefore, given the presence of pure economic rent in the upstream, producers usually accept to be exposed to higher economic risks in other market segments in order to “monetise” their reserves.

The economic, technological and institutional context of gas and electricity industries in the Southern Cone has changed radically in the last decade. The current context is very different from 1980s and early 1990s. The new context is characterized by the collapse of traditional

patterns of financing, with strong public funding restrictions and low levels of financing from multilateral institutions (Almeida e Pinto Jr., 1999). The current industrial dynamic is characterized by the presence of “global players” orienting their strategies to the exploration of synergies between different national markets (Flowers, 1998 and Almeida and Oliveira, 2000). These companies are capable of investing on a sufficient scale to integrate their activities regionally. Additionally, technological breakthroughs such as combined cycle gas turbines are playing an important role in the expansion of the electricity supply in the Southern Cone. Therefore, economic synergy has increased with the technological and business convergence of gas and power.

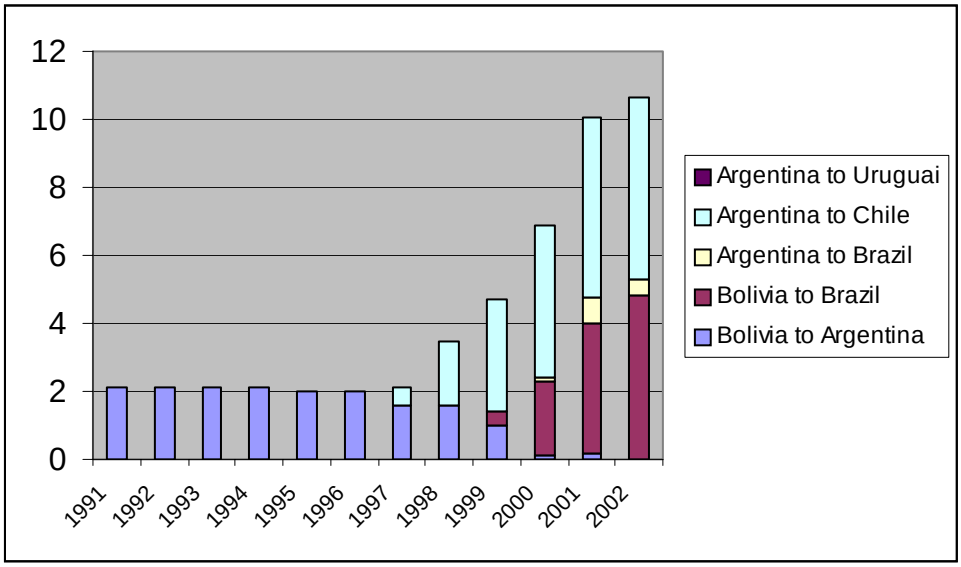
The new economic context of the energy industries in the region favors energy integration. Though deep changes were introduced in the industries’ structure, policymakers reserved a new role for energy integration. This is not only desirable for promoting regional economic convergence but is also a necessary condition for fulfilling the growth potential of these industries.

2 – The Main Drivers for the Energy Integration

Cross-border gas trade in the Southern Cone began in the 1960s with Bolivian exports to Argentina. Until 1997, this was the only cross-border project in the region. Since 1997, gas trading in the Southern Cone has increased at an exponential rate, with Argentine exports to Chile, Uruguay and Brazil and Bolivian exports to Brazil (see figure 1).

Figure 1

Cross-border gas trade in the Southern Cone



Source: Enargas and ANP

Despite the rapid growth in recent years, the potential for growth of the regional gas market is even greater if we take into account the drivers for cross-border gas trade in the region.

Aside from broader considerations concerning the benefits of gas integration in the Southern Cone (strengthening regional ties, promoting product prices convergence, stimulating economic growth, etc.), there are three main factors that will push the expansion of cross-border trade. The first is the complementarities between gas demand and supply among the countries of the Southern Cone. Reserves are heavily concentrated in Bolivia and Argentina, while future demand in the region, according to the International Energy Agency (IEA, 2003), will grow fastest in Brazil, Chile and Uruguay. Of these three countries, the latter two have very small gas reserves (nil in the case of Uruguay), meaning they will be dependent on natural gas imports to satisfy demand. Though Brazil has substantial gas reserves, its largest fields will take some time to develop (8-15 years, depending on demand conditions). More importantly, Brazil´s gas market has enormous potential, and rapid demand growth will require more imports from Argentina (to southern Brazil) and Bolivia (to central, southeastern and possibly northeastern Brazil).

The second driver of regional integration is the existing transmission network linking the gas markets of the Southern Cone. As detailed below, gas pipeline networks linking Argentina to Uruguay and Chile and Bolivia to Brazil and Argentina provide a solid base for the expansion of cross-border trade. A short 25-km pipeline also links Argentina and Brazil, part of a much larger, unfinished project to supply southern Brazil with Argentine gas. This project, as with the expansion of Southern Cone cross-border trade in general, depends on demand growth in Brazil. Though presently well below expectations, steady increases in Brazilian gas consumption could induce the investments in transmission and distribution (plans for which already exist in many cases) so crucial to the growth of a regional gas market.

The third factor pushing the development of cross-border trade is the presence of large multinational energy companies (global players) in the Southern Cone. Though blessed with strong regional companies such as Argentina´s Pluspetrol and Brazil´s Ipiranga and Odebrecht, the immense financial and technological capacity of the global players active in the region (British Gas, BP, Repsol-YPF, Total-Fina-Elf, Shell and others) could allow growth of cross-border gas trade in the Southern Cone to explode.

In addition to the global players, another important (perhaps the most important) player in the region is Brazil´s state-owned energy company Petrobras. With its control over the Brazilian gas market, Petrobras has a key role to play in stimulating demand for cross-border flows of natural gas.

2.1 – Supply and Demand Conditions

We provide below a brief overview of the gas market in each of the countries of the Southern Cone (Bolivia, Brazil, Argentina, Chile, Uruguay and Paraguay). The purpose of the country analysis is to demonstrate how the complementarities of gas supply and demand can contributes to promote the cross-border gas trade.

We begin our country analysis with Argentina and Bolivia, the major holders of reserves in the region and the main importing countries (along with Brazil perhaps) in any future cross-border trade scheme.

Table 1

Proven Natural Gas Reserves (Billion Cubic Meters—Bcm)

	Reserves	*Production*	*Consumption*
Argentina	*764*	45.9	*31.28*
Bolivia	*775*	*7.1*	*1.7*
Brazil	*630*	*14*	*9*
Chile	*96*	*1.1*	*6.5*
Paraguay	*-0*	*0*	*0*
Uruguay	*-0*	*0*	*0.3*

Source: ANP, EIA (U.S. DOE) and the International Energy Agency (IEA)

Bolivia

Bolivia´s possesses the second largest gas reserves in South America, after Venezuela. The country´s reserves-to-production ratio (almost 100 years) and its level of gas consumption symbolize the impressive potential for cross-border gas trade in the Southern Cone. Of the 775 billion cubic meters (bcm) or 27.3 trillion cubic feet (tcf) in proven reserves verified at the beginning of 2003, Bolivia produced 8 bcm (282 bcf) and consumed 2 bcm[4]. The difference was made up by exports to Argentina (fueling a refinery and a power plant close to the Argentina/Bolivia border) and Brazil.

Bolivia´s proven reserves have risen 500% since 1999, indicating the country´s massive reserve potential. In fact, counting probable reserves Bolivia possesses over 50 tcf (1.48 tcm). Bolivia is also host to some of the world´s largest gas producers, including Total Fina Elf, BP Amoco, British Gas, Repsol-YPF and Petrobras. Petrobras holds one-third of total Bolivian reserves.

Though equipped with large quantities of gas and the financial and technological now-how to benefit from the resource (with the presence of major global players), Bolivia depends on gas export markets. The potential for gas exports to Argentina, however, is small and the Brazilian import market has proven much smaller than originally expected. Projected to import close to 20 mcm/d of Bolivian gas by 2004, Brazil currently imports 11 mcm/d, which is not even enough to fulfill the terms of Petrobras´s gas import contract with Bolivia state oil and gas company YPFB. As a result of the small internal market and limited exports, producers in Bolivia were forced to reinject, flare or vent close to 50% of production in 2001. Forecasts for the next 20 years estimate

[4] Estimates based on U.S. Department of Energy (DOE) data.

that the Bolivian market will absorb only 20% of existing reserves, leaving lots of room for exports.

Bolivia´s main *potential* export markets are Brazil, Argentina, Uruguay, Chile and the United States. Pacific LNG, a consortium led by Repsol-YPF, has plans to export roughly 28 mcm/d to California[5]. Since Bolivia is landlocked, the US$ 5 billion project depends on the construction of a 510 to 560-mile gas pipeline to a Chilean or Peruvian port. The consortium and the Bolivian government, however, face stiff opposition from opposition groups in Bolivia. Opposition leaders consider the use of the Chilean port an outrage since Bolivia lost its coastline to Chile in a late 19th century war. The Peruvian alternative also faces resistance from leaders and organizations concerned with the environmental and economic effects of the project. Additionally, it is important to consider that an LNG plant in Peru would stimulate de development of the Peruvian giant gas field located (Camisea), currently stranded due to lack of gas markets in Peru. Therefore, exporting through Peru is not a good strategy for the Bolivians, since this option can result in more competition.

In the long term, say 15-20 years from now, Bolivia could resume exports to Argentina, assuming the latter country recovers from economic depression. Argentina would be a welcome trade partner, as it boasts the largest natural gas market in South America. Natural gas accounts for 38% of total primary energy supply, 60% of residential energy demand (a result of gas demand for space heating.

Argentina

Argentina has the second largest reserves in the Southern Cone after Bolivia. Reserves totaled 764 bcm (26.9 tcf) in 2001, while proven and possible reserves reached almost 1.1 tcm, slightly less than the 1.5 tcm in proven and possible reserves in Bolivia. Gross production in Argentina was 45.9 bcm in 2001. Though reserves have increased by over 200 bcm since 1993, no major discoveries have been made since then. Much of Argentina´s reserves and production, furthermore, are concentrated in one basin, the Neuquén, which holds 50% of proven reserves and accounts for 60% of current production.

The dominant players in the Argentine gas market are Repsol-YPF and Total Austral (a subsidiary of TotalFinaElf). Together these two companies control 50% of Argentine reserves and accounted for 47% of production in Argentina in 2001. The Argentine company Pluspetrol is another major player in the country´s gas market, holding 11% of the country´s reserves and accounting for 12% of total production.

Argentina currently exports gas to Brazil, Chile and Uruguay. Argentina began exporting gas to Chile in 1997, exporting 5.3 bcm to the latter in 2001. Exports to Brazil started in 2000 and are limited to a 634-MW thermal power plant in the municipality of Uruguaiana in the Brazilian state of Rio Grande do Sul. Argentina also exports gas to Uruguay, though this total was less than 5 mcm in 2001.

As with cross-border trade in the Southern Cone as a whole, growth in Argentina´s export market depends on Brazilian demand. The major Argentina-Brazil pipeline project is the Paraná-Uruguaiana-Porto Alegre connection, which would bring significant volumes of Argentine gas to

[5] *Dow Jones Business* News, Stephan Kueffner, Sept. 17, 2003

industries and power plants in southern Brazil. Today, a 25-km pipeline beginning in Paraná, Argentina feeds the Uruguaiana power plant. Weak demand has delayed the project´s completion, put on hold in late 2002.

Chile

Natural gas accounts for 22% of total primary energy consumption in Chile. Chile produced 40 bcf (1.1 bcm) of natural gas in 2001 and consumed 228 bcf (6.5 bcm). The difference was made up by imports from Argentina (188 bcf). According to the US Department of Energy[6], Chile had 3.5 tcf (100 bcm) of natural gas reserves at the beginning of 2003, paling in comparison to Argentina´s 27.3 tcf and Bolivia´s 26.9 tcf (the disparity is even greater if we take into account possible reserves). Additionally, most of these reserves are located in the extreme south of the country, making uneconomical to consume it in the main populated areas of the country (Santiago area).

Demand in Chile has skyrocketed since the early 1990´s, increasing 338% between 1991 and 2001 (52 bcf in 2001). Much of the increase is a result of the Chilean government´s decision in the 1990´s to reduce its dependency on hydropower, which supplied 60% to 80% of the country´s electricity between 1991 and 1996. A severe drought from late 1997 to well into 1999 caused several blackouts in the capital city of Santiago, offering fresh motivation for the government to increase gas-fired generation capacity. Seven new gas pipelines were built between 1996 and 1999 to carry Argentine gas to the north, center and southern regions of the country. Thermal power capacity increased from 40% of total power generation in the early 1990´s to almost 60% in 2000. In 2000, natural gas accounted for 22% of total power generation, up from only 1% four years earlier.[7]

In April 2002, the Chilean National Energy Commission (CNE) projected the construction of ten new gas-fired power plants by 2010. Though the Argentine crisis has made electricity generators in Chile uneasy about its dependency on Argentine gas imports, gas demand in Chile should continue to increase in the near future. The CNE estimates consumption will reach over 500 bcf in 2011.

Though Chilean imports will continue to come entirely from Argentina, gas trade between Bolivia and Chile could begin soon if the Pacific LNG project goes ahead. Bolivia would use the Chilean port city of Patillos to export LNG to the United States and Mexico. Discussion on the project began in 2001 after the Pacific LNG consortium, the group composed of Repsol-YPF, BP and British Gas heading the LNG project, discovered an enormous quantity of gas in southern Bolivia. As mentioned, though the consortium prefers exporting the gas via Chile, a political dispute between Bolivia and Chile has led the Bolivian government to consider the Peruvian port city of Ilo as an alternative.

Uruguay and Paraguay

At the moment, Uruguay and Paraguay are virtual non-entities in the regional gas market. Paraguay, dependent on hydropower for 99% of its electricity generation, neither consumes nor produces natural gas, nor does it have natural gas reserves. In 2002, however, Paraguay seemed to be on its way to becoming a transit point for Bolivian gas imports to Brazil.

[6] See Energy Information Administration at www.eia.doe.gov .
[7] Energy Information Administration, Chile Country Analysis Brief, August 2003

In March 2002, Paraguayan and Bolivian officials signed a preliminary agreement regarding the construction of the 3,300 mile Gas Integration Pipeline (GASIN), scheduled to begin in 2003 and completed in 2005. The project, however, has been shelved for the moment since Brazil is barely fulfilling the terms of its contract for gas imports through the Bolivia-Brazil Pipeline.

Uruguay´s gas market is much more promising. Though Uruguay consumed only 3 million cubic meters (mcm) in 2001, the construction of new gas-fired power plants over the next ten years should lead to a sharp increase in demand. Since Uruguay has no proven gas reserves, this demand will be satisfied entirely by Argentine imports. Construction of the 208-km, 5-mcm/d *Cruz del Sur* pipeline (see below) started in March 2001 and gas deliveries to power plants were expected in 2002. The project, however, has been delayed by the economic crises in Argentina and Uruguay.

Uruguayan consumption through the *Cruz del Sur* pipeline is crucial to promoting cross-border trade in the Southern Cone. The pipeline project linking Buenos Aires to the Uruguayan cities of Colonia and Montevideo is part of a broader plan to link Argentina to the city of Porto Alegre in southern Brazil. With the extension of the *Cruz del Sur*, the pipeline will extend 415-km in Uruguay and 505-km in Brazil. The main obstacle to this pipeline is, once again, the weak gas demand in Brazil. Given the low consumption in the region´s largest country, the *Cruz del Sur* extension plan conflicts with the uncompleted Paraná-Uruguayan-Porto Alegre pipeline project to bring Argentine gas directly to Brazil.

Brazil

Though far behind Argentina in terms of gas consumption, Brazil´s gas market has the largest demand potential in Latin America. Gas consumption in Brazil was 11.5 bcm in 2002, up from 10.4 bcm in 2001. In the late 1990´s through 2001, analysts expected gas demand in Brazil to soar as the government announced the construction of over 40 gas-fired power plants by 2010. Some predicted gas consumption would reach 60 mcm/day by 2005, more than double the 28 mcm/day consumed today. Though these expectations have proven inflated, due to the failure of Brazil´s thermal power generation program (PPT), gas demand in the country should grow steadily in the years to come as industrial and vehicular demand as well as demand for power generation increases (though not as quickly as originally thought). According to Petrobra´s Strategic Plan report[8], natural gas consumption will increase 11.4% a year through 2007, from 28.5 mcm/d in 2002 to 48.8 mcm/d. Given current production levels, at 20 mcm/d (not including reinjection, flared or vented production or volume shrinkage), either production will have to increase rapidly or Brazil will have to import more gas from Bolivia and Argentina.

Since the mid-to-late 1990´s, Brazil has been eyed by Argentine and Bolivian producers as the Southern Cone´s primary outlet for gas exports. Brazil´s role as an importer, however, will have to be reevaluated in the midst of Petrobras´s impressive gas discovery in southeastern Brazil in April 2003. With 236 bcm in reserves at the beginning of 2003, the April discovery off the coast of São Paulo elevates the country´s reserves to an estimated 630 bcm, comparable to the 775 bcm and 763 bcm in Bolivia and Argentina, respectively.

[8] *Plano Estratégico 2003-2007*, April 25, 2003 (www.petrobras.com.br/)

Even before the discovery in São Paulo, the market for Brazilian gas imports, mainly from Bolivia, was facing serious difficulties. Indexed to the dollar, the price of Bolivian gas in recent years has caused distributors, industrial consumers and large power generators in the south of Brazil to limit gas consumption and hold off on investments in infrastructure. Under the terms of the take-or-pay contract signed with Bolivia´s state oil and gas company YPFB, Petrobras is currently paying for more gas than it actually imports (consuming 11.5 mcm/day, paying for 15 mcm/d).

With the price of Bolivian imports strangling demand potential and forcing Petrobras to essentially burn off 4 mcm/d (in imports paid for but not consumed), Petrobras has all the more incentive to take advantage of Brazilian reserves to stimulate gas consumption (by offering steady supplies of cheaper domestic gas) in southern and southeastern Brazil, the country´s industrial heartland.

Though the discovery in São Paulo certainly does not eliminate Brazil´s need for imports in the short-term, it does put serious doubts on Brazil´s long-term role as catalyst for cross-border gas trade in the Southern Cone. In around eight years, Petrobras could have the capacity to produce around 50 mcm/d in the Santos Basin alone, greater than current production levels in the country as a whole today. This will put tremendous pressure on Petrobras to find a use for this gas, affecting Bolivian and Argentine imports within 10-12 years, if demand does not grow rapidly.[9]

2.2 - Transmission Network in the Southern Cone

Apart from the complementarities of the demand and supply of gas reserves in the Southern Cone, another factor that could push regional integration is the relatively developed pipeline network linking the countries of the Southern Cone (see figure 2). Regional pipelines were almost non-existent in the region until 1996. From 1972-1996, the 441-km, 24-inch *Yabog* (Yacimientos-Bolivian Gulf) pipeline was the only cross border pipeline in South America. *Yabog* connects Rio Grande, in the region of Santa Cruz de la Sierra (also the starting point for the Bolivia-Brazil pipeline), to Campo Duran, in the province of Salta, Argentina.

Bolivia exported over 3 bcm a year to Argentina from 1972 to June 1999, when the *Yabog* export contract expired. Today, the Yabog pipeline is not in operation, since its controller (Repsol) seems not interested to import gas from Bolivia, given its large gas reserves in Argentina. However, Bolivia still exports small quantities of gas to Argentina through another recent build cross-border pipeline owned by Argentina´s Pluspetrol. This short pipeline link Pluspetrol´s gas reserves in Bolivia (Bermejo and Madrejones, close to the Argentina border) to the company´s facilities in the Salta province.

[9] Mielnik, Otavio and Bailey, Jed, CERA Advisory Service, *Santos Basin Gas Find May Triple Brazilian Reserves*, Sept. 5, 2003

Figure 2

Transportation Network in the Southern Cone

The Bolivia-Brazil Pipeline (*Gasbol*) is the largest gas pipeline in South America. *Gasbol* transports Bolivian gas from the municipality of Rio Grande in Bolivia to the Brazilian states of Mato Grosso do Sul, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul. The pipeline extends 2,593 km within Brazilian territory alone and has a capacity of 30 million cubic meters per day (mcm/d). The Brazilian portion of the pipeline is operated by *Transportadora Brasileira Gasoduto Bolívia-Brasil S/A* (TBG), a consortium composed of Petrobras subsidiary Gaspetro (51%) and several international investors, including Enron (7%), Shell (7%), British Gas, El Paso and TotalFinaElf (roughly 10% control each). The same companies control the Bolivian portion of the pipeline as well, operated by *Gas Transboliviano* (GTB), along with Bolivian pension funds.[10]

A second international gas pipeline, the Bolívia-Cuiabá Pipeline (known in Brazil as *Lateral-Cuiabá*), transports gas from Rio San Miguel in Bolivia to Cuiabá in the Brazilian state of Mato Grosso. The pipeline, owned and operated by Enron and Shell (a Bolivian pension fund

[10] International Energy Agency (2003). *South American Gas: Daring to Tap the Bounty*, Paris.

also has an ownership stake), has a capacity of 2.8 mm³/day and feeds an Enron/Shell power plant in Cuiabá.

The third cross-border pipeline, owned by *Transportadora Sul Brasileira de Gás* (TSB), carries imported gas from Argentina to the 600-MW Uruguaiana thermal plant in the state of Rio Grande do Sul. The TSB project, however, envisions a second leg of the pipeline from Uruguaiana to the city of Porto Alegre, the capital of Rio Grande do Sul. If the second leg is concluded, the TSB pipeline will have final capacity of 12 mcm/d. TSB is a consortium composed of Petrobras, the private Brazilian company Ipiranga, Respol-YPF (Spanish-Argentine), Tecgás NV-Techint (Argentine) and *Nova Gás Internacional* (Canadian).

Between 1996 and 1999, seven pipelines were built between Argentina and Chile, making the cross-border gas network between the two countries the most extensive in South America. The first pipeline between Argentina and Chile was the 83-km, 14 inch *Tierra del Fuego* pipeline, which was built to supply a methanol plant in the extreme south of Chile operated by Methanex. Two smaller pipelines were built in 1999 to complement the Tierra del Fuego. Like the first pipeline, these have a capacity of around 2 mcm/d.

The two largest pipelines connecting Argentina to Chile are the 1,066-km, 7.1 mcm/d *NorAndino* pipeline and the 941-km, 8.5 mcm/d *GasAtacama* pipeline. The *NorAndino* began operating in November 1999 and links Argentina´s Northwest Basin in Salta Province to Mejillones in Chile, where it supplies industrial clients, a power plant (Tocopilla) and the world´s largest copper-mining industry. The *GasAtacama* also links Salta to Mejillones and supplies gas to industrial clients as well as to power plants, two of which were part of the *GasAtacama* project. The pipeline began operating in July 1999.

Chile´s other two cross-border pipelines are the *GasAndes* pipeline and *Gasoducto del Pacífico*. GasAndes has a throughput capacity of 9 mcm/d and supplies Santiago´s gas distribution company Metrogas and a 379-MW power plant (Electrogas) in Nueva Renca, Chile. *Gasoducto del Pacífico* has a capacity of 9.7 mcm/d and supplies mainly cellulose, paper, cement, steel, glass and fish processing factories to the Bio-Bio region in southern Chile. The pipeline also delivers gas to residential consumers.

Argentina began exporting to Uruguay in late 1998 through the 26-km, 0.7 mcm/d *Gasoducto del Litoral*, linking the Argentine province of Entre Ríos to Paysandú in Uruguay. A branch was added in 2000 to supply a 360-MW power plant in Casablanca, Uruguay. Since then, a consortium made up of British Gas (405), ANCAP, the Uruguayan state oil and gas company, Pan American Energy and Wintershall have built the 208-km, 5 mcm/d *Cruz del Sur* pipeline (see above) to supply Uruguay´s state electricity utility UT E in Montevideo. *Gazeba*, Montevideo´s local distribution company, and CONECTA, the distributor in the rest of the country, are also likely to become customers. UTE has entered into a long-term gas sales agreement to purchase Pan American/Wintershall´s Argentine gas reserves.

Gas reserves in the Southern Cone are concentrated heavily in Bolivia and Argentina, the two traditional natural gas exporting countries in the region. Brazil and Chile, the main natural gas consumers in the region (apart from Argentina), have either small (as in the case of Chile) or large but undeveloped reserves (as in Brazil´s case).

2.3 - Regional Players

As stated above, transnational oil and gas companies control a significant part of Latin America´s energy resources and infrastructure. These companies tend to have a leading role in cross-border gas trade in the Southern Cone. The main international companies present in the Southern Cone gas market are Repsol, BP, British Gas, El Paso, Enron, Repsol-YPF, Shell and TotalFinaElf. Another important company, perhaps the most important, in developing a regional gas market is Brazil´s energy giant Petrobras. Though not quite on par in terms of size with, for example, Shell and TotalFinaElf, Petrobras´s importance derives from its position as the dominant energy company in the region´s largest energy market, Brazil. Cross-border gas trade, furthermore, depends fundamentally on the expansion of the Brazilian gas market, which in turn will depend on Petrobras´s ability to expand gas infrastructure and increase the share of natural gas in Brazil´s energy market.

Following a trend witnessed across the globe, the Southern Cone´s energy industries underwent a period of intense deregulation and privatization in the 1980´s and 1990´s. This allowed companies headquartered in Europe (BP, British Gas, Shell, TotalFinaElf) and the United States (Enron, El Paso) to buy formerly state-owned assets and invest heavily in energy production, transmission and distribution.

As the multinationals flocked to the region, governments in the Southern Cone, notably Argentina, Chile and, later on, Brazil, were letting go of assets and cutting back on public investments in their respective energy industries. After 10 or so years, this process has given the global players a central role in the Southern Cone gas market. The current push for regional energy integration is taking place at a time when states in the region have lost their capacity to directly invest in the infra-structure to promote cross-border energy trade.

At the end of 2002, the eight largest natural gas companies in the Southern Cone region controlled 74.2% of gas reserves, 66% of production, 47.6% of transport capacity and 30.4% of the distribution market (see table 2). With the exception of Enron, these companies have penetrated each segment of the natural gas chain, turning themselves, in a remarkably short period, into vertically-integrated oligopolists in the Southern Cone gas industry (table 3).

Table 2
Participation of the Main Natural Gas Companies in Mercosur[11]

	Reserves		Production*		Transmission**		Distribution***	
	Bcm	%	Mcm	%	Km-inches	%	Mcm/d	%
British Gas	154.8	8.3%	414	0.7%	7.715	3.6%	10.899	11.3%
BP	183.4	9.9%	4.472	7.0%	7.866	1.6%	-	-
El Paso	9.4	0.5%	492	0.8%	8.503	1.7%	-	-
Enron	-	-	-	-	82.809	16.9%	1.188	1.2%
Petrobras	775	29.6%	12.810	20.1%	74.952	15.3%	3.933	4.1%
Repsol-YPF	406.8	21.9%	15.903	25.0%	3.908	0.8%	12.335	12.8%
Shell	-	-	-	-	22.378	4.6%	824	0.9%
TotalFinaElf	286.4	15.4%	7.992	12.6%	32.654	6.7%	-	-
Total Southern Cone	2,160.2	100%	63,672	100%	489.884	100%	96.034	100%
Total players		74.2%		66.1%		51.2%		30.4%

Source: Adapted from Almeida et al. (2002)

* Data refer to block operators .

** Chilean pipelines not included.

*** Bolivian data not included.

Table 3
Main Players in the Mercosur Energy Market

Company	E&P	Gas Transm.	Gas Distribution	Power Generation	Power Distribution
BP	BRA, BOL	BRA, BOL	BOL	-	-
British Gas	BRA, BOL	BRA, BOL	ARG, BRA	-	-
El Paso	ARG, BRA, BOL,	BRA, BOL	-	ARG, BRA	BRA
Enron	-	ARG, BRA, BOL	BRA	BRA	BRA, BOL
Petrobras	ARG, BRA, BOL	BRA	BRA	BRA, BOL	BRA
Repsol-YPF	ARG, BRA, BOL	ARG, BRA, BOL	ARG, BRA	ARG, BRA	-
Shell	ARG, BRA, BOL,	BRA, BOL	BRA	BRA	BRA-
TotalfinaElf	ARG, BRA, BOL,	ARG, BOL, BRA	-	BRA	-

ARG = Argentina; BRA = Brasil; BOL = Bolivia; LA = Latin America ; x = active
Source: Own elaboration

[11] Note: with the exception of Petrobras, the data refer to 2001. Reserves data for Petrobras refer to August 2003. Considering that, besides Brazil, no major gas discoveries were made in the region, the data remains a close estimate of the current situation.

3 – The Main Obstacles for the Regional Gas Trade

Since private companies tend to be the main players in cross-border gas trade projects, investment decisions are subject to very conservative evaluation criteria. Thus, one of the most important challenge for promoting cross-border gas trade in the region is to reduce the risk perceived by private investors and project sponsors.

As mentioned in section 1, investments in the NGI face important risks associated with the specificities of the natural gas industry: i)a great deal of interdependence among agents throughout the productive chain; ii) presence of sunk costs; iii) strong inter-fuel competition in the end-market. Cross-border gas trade projects imply greater economic risk than domestic projects. Uncertainties associated with international transactions are more important because the number of parameters subject to change increases (regulatory risk, exchange rate risk, market risk and political risk).

The barriers mentioned above are more intense in the case of the Southern Cone. As discussed at the outset, we emphasize three additional barriers specific to the Southern Cone: i) strong exchange rate volatility; ii) energy policy assymetries and iii) regulatory assymetries. These problems results in a high probability of imbalances in the long-term contracts that anchors cross-border gas trade in the region. These problems will be analyzed in detail in the following sections.

3.1 - The Macroeconomic Barriers

The energy sector is more intensely affected by the macroeconomic context than other industrial sectors, especially in Latin America. Investments in this sector require a high volume of resources unavailable in local financial markets. Firms' investment capacity depends mostly on their access to international financial markets. Therefore, macroeconomic policy has an important impact on the industry's potential for expansion. On the other hand, energy prices are crucial for controlling inflation, and governments tend to increase price controls during economic crises. This deteriorates even further companies' capacity to invest.

As far as cross-border energy trade is concerned, the main source of macroeconomic instability is exchange rate volatility. Though the creation of Mercosur was a significant event, ,the regional economic block is much different from others created in the past such as NAFTA, the EU and ASEAN. Mercosur represents the only attempt to integrate relatively industrialized markets without a strong currency convertible in the international market. The absence of a strong currency in the region has important implications for the dynamics of market integration, especially in industries that depends on long-term contracts.

In the absence of a strong currency, price volatility assumes a different dimension. Equilibrium in the external accounts of the Mercosur countries depends on the flow of strong currency from outside the block. Adding this to the peripheral position of the region in international trade and financial flows gives us a fairly good explanation for the frequent exchange rate crises that occur in the region. Since the financial and trade flows within the region are made in dollars, the volatility of gas prices in *reals* or *pesos* becomes extremely high.

Traditionally, international gas trade is anchored by long-term contracts with take-or-pay and ship-or-pay clauses. This type of contract aims to assure the shipper and transporter a steady cash flow, facilitating supply-side investments. On the other hand, local distribution companies try to

fix end prices at a level that allows gas to compete with substitute fuels (netback price system). This traditional pattern of transactions conflicts with the economic reality of the region. As the price of fuels that compete with gas has been liberalized, the frequent variations in the price of these fuels implies equally frequent variations in gas prices. Additionally, exchange rate variations also require changes in final gas prices. Therefore, long-term contracts frequently become unbalanced, as the margins of a specific segment of the chain shrink due to unanticipated changes in relative prices.

Brazil´s gas import contract with Bolivia is a clear example of how exchange rate volatility can disrupt a rigid take-or-pay agreement. Market conditions in Brazil changed radically from when the contract was elaborated and signed (1996). The rapid devaluation and volatility of the Brazilian currency has created a hostile economic environment for selling natural gas quoted in US dollars. Additionally, the devaluation process increased the difficulties for financing investments in gas-fired thermal power plants and gas distribution. As a result, the pace of development of the natural gas market in Brazil has been much slower than most analysts expected. Petrobras is facing severe difficulties to cope with the take-or-pay provision of its gas import contract with Bolivia. In August 2003, Petrobras was importing only 12 mm3/d, while the take-or-pay provision requires 17 mm3/d.

This example demonstrates that projects for natural gas trade within the Southern Cone face more important economic risks then those oriented to gas exports for countries with strong currencies. Therefore, in order to promote cross-border gas trade within the Southern Cone, governments and companies must launch a joint effort in search of a new institutional and regulatory environment, as well as new contractual practices that mitigate the current risks.

3.2 – Energy Policy Assymetries

One of the most important features of a favorable investment environment is a stable and transparent regulatory framework. The transaction costs related to long-term contracts are lower if the agents expect few changes in the market rules during the lifetime of the contract. One of the pre-conditions for a clear and lasting regulatory framework is the existence of an energy policy, including for the long-term. Regulatory activity is basically about choosing the best way of implementing political decisions outlined by an energy policy. In the absence of an adequate energy policy, regulatory activity becomes unstable, increasing the transaction cost and making it difficult to find appropriate governance structures for new investments. The rate of investment tends to be below the potential rate and companies will tend to adopt vertical integration or other more cooperative types of governance structures (Williamson, 1995 and Joskow, 2002).

As far as energy integration is concerned, policy must specify the desired level of integration and the type of convergence aimed for the regulatory framework (**???**). The EU gas directive is an example of an energy policy that establishes a clear ground for the regulatory framework at a countries level. This type of energy policy is lacking in the Mercosur region. Even though member countries have several times agreed on the importance of energy integration, no treaty has clearly established the objectives and conditions for regional energy integration.

Another important dimension of energy policy is its effect on expectations concerning competition in the energy sector. Decisions concerning today’s investments are based on what players think the sector will look like in the future, i.e. whether it will relatively open or closed to

foreign or private investments, or whether it will be dominated by one firm or by many firms. The energy policy should specify what kind of industry the government wants to implant and how regulators should act to achieve the desired configuration.

The expectations of analysts and investors in the Southern Cone today depend on the energy policy of the new government in Brazil. This is because most of the increase in the international gas trade in the Mercosur zone will depend on the development of the Brazilian gas market. As far as cross-border gas trade is concerned, energy policy should address the following questions: i) the role of competition in the development of the Brazilian NGI; ii) the desired industry structure; iii) the priority given to the integration of natural gas markets in Mercosur; iv) and the role of the natural gas in the regulatory reform under discussion for the electricity sector.

A clear political decision by the Brazilian government concerning these questions is crucial to reducing risk perceptions. Until now, the new Administration has not been clear on energy policy, especially concerning cross-border gas trade. Without this piece of energy policy, energy regulators cannot ensure coherent legislation and guidelines for companies and potential investors.

Brazil´s government is having trouble defining a clear policy for the gas sector because of short term problems concerning the gas import contract signed with Bolivia and the financial collapse of several thermal generation projects. Petrobras has been the company most affected player by these problems, and the government does not seem willing to impose policies that could harm the state enterprise´s interests[12]. Therefore, the short-term agenda in Brazil has damaged the formulation of long-term policy[13].

3.3 – Regulatory Assymetries

The Southern Cone countries are implementing reforms in the energy sector that follow the general guidelines recommended by multilateral credit institutions (Almeida and Pinto Jr., 1999). However, we can verify an important heterogeneity in the regulatory framework and in the rhythm of the implementation of the reforms. Several factors contributes to the disparities: i) different degrees of development of energy industries; ii) different levels of complexity in the political process driving the reform; iii) diversity in the industries´ organization and structure; iv) and different levels of state intervention in the energy industries.

Table 1 summarizes the main asymmetries in the institutional and regulatory frameworks in the Mercosur member and associated countries. As we can see, the privatization in the gas and electricity sectors has not reached the same level in all countries. Argentina, Chile and Bolivia have practically completed the privatization of their gas and electricity sectors. This process is much less advanced in Brazil, Paraguay and Uruguay.

All important gas producer countries have liberalized their upstream sector. In other words, there are no more institutional barriers to entry in the upstream sector. Nevertheless, the industry

[12] Petrobras has been frequently compelled by the government to expose itself to risky contracts in order to induce investments in projects such as the Bolivia-Brazil Pipeline and Gas-fired thermal power plants. This argument is often used by company's officials to argue against a more market oriented regulatory framework, especially concerning open-access and unbundling rules.

[13] Actually, this problem has also happened in Cardoso government.

structure of Brazilian upstream is still very concentrated, and Petrobras is the only gas producer in the country.

Considering that the upstream of the gas industry has been opened for new entrants, the open-access to the gas transmission infrastructure is crucial for inducing new investments. If open-access is not possible, potential new entrants will have a harder time monetizing new gas reserves. Restrictions to pen-access have a negative effect on upstream investments. As we can see in table 1, open-access to transmission pipelines is operational only in Argentina and Chile. This means that, in practice, companies exporting gas to Brazil and Uruguay are forced to sell their gas to the controllers of the gas transmission infrastructure.

It is also important to mention that a common gas transmission tariff system is crucial to lowering the price of gas to final consumers. Transportation costs represent an important share of the final gas price (about 50%). If distance is not considered in the gas transportation pricing system, gas imports from fields located near the final market can be displaced by domestic gas located far away from this market. In Brazil, a portion of the domestic gas pipeline network operates under a transportation tariff that does not take into account the distance the gas travels (as is the case with the Bolivia-Brazil pipeline). For example, Argentine gas located near final markets (approximately 600-km from Porto Alegre) is currently being displaced by Bolivian gas located some 3000-km from the same city. Therefore, different pipeline tariff systems represent a barrier to more integrated gas market.

Another important point is the level of convergence between the gas and electricity industries. Currently, gas-based electricity generation represents one of the best ways to monetize gas reserves. This has induced several companies holding gas reserves in Argentina to integrate vertically with the electricity generation sector. In order to make this strategy viable, it is very important to have not only open-access to pipelines but also the option of by-passing the gas distribution companies. The liberalization of the electricity sector is also an important initiative. The by-pass makes it possible for electricity generator to contract directly for their gas supplies. As for the liberalization of the electricity sector, this will create a spot market for gas and allow gas-based generators to arbitrate in the gas and electricity markets, inducing price convergence between these two markets.

Table 1 shows that only Argentina, Chile and Uruguay allow power generators to by-pass the gas distribution companies. Argentina, in addition, has the only spot market for gas. Finally, only Argentina, Chile and Bolivia have completely liberalized their electricity sectors. Therefore, given the current regulatory framework, the convergence between the gas and electricity industries is significant solely in Chile and Argentina.

The regulatory asymmetries mentioned above represent an important obstacle for cross border gas trade and the convergence of gas markets in the region. Though there are no major asymmetries between Chile and Argentina, the most integrated gas markets in the region, the growth of the gas trade in the rest of the region will depend on the creation of more coherent regulatory frameworks. This is especially true of Brazil, the most important gas market in the region.

Table 1– Institutional and Regulatory Framework in the Gas and Electricity Industries in the Southern Cone Countries

	Argentina	Bolívia	Brasil	Chile	Paraguay	Uruguay
Privatisation in the gas sector	total	Almost complete	Partial	Total	-	Total
Privatisation in the electricity sector	total	Complete	Partial	Total	No	No
Liberalization in the Upstream	Yes	Yes	Yes	No	No	No
Open-access to gas transport pipelines	Yes	Non-operational	Non-operational	Yes	No	Non-operational
Open-access to gas distribution pipelines	Yes	No	No	Yes	No	Yes
By pass to distribution utilities	Yes	No	No	Yes	No	Yes
Spot market in the gas sector	Yes	No	No	No (but uses Argentina’s as reference	No t	No
Level of maturity in the gas industry	High	Low	Low	Low		Low
Level of liberalization in the electricity industry in the gas sector	High	High	Low	High	Not liberalised	Not liberalised
Level of convergence between the gas and electricity sectors	High	Incipient	Incipient	High	Absent	Incipient

Source: own elaboration

4 – The Role of the Government and Companies

Given the high level of risks due to the interdependence between the players involved in one transaction and the specificities of assets of the gas and electricity industries, market mechanisms are not sufficient to provide an adequate governance structure for projects. Government must create additional mechanisms to coordinate investments, such as rules governing markets and competition and systems of guarantees and indicative planning.

Regarding the role of government, it is worth emphasizing the coordination of energy planning aimed toward the expansion of Mercosur. Since international projects require the authorization of the governments involved, it is important that these governments work together in deciding how to use the energy resources of each country. After determining how the resources of each country should complement one another, governments can then indicate to private agents which projects should be given priority.

Coordinating investments does not simply mean devising an energy plan for the region. Investment projects are directly affected by regulation in each country and, thus, governments must be active participants in project negotiations. Confronting regulatory asymmetries within each country should be Mercosur´s number one priority. In attempting to improve regulatory systems, governments should take into account the advances already made with energy reform in other countries. Along the same lines, in establishing rules regarding energy policy and competition, regulatory agencies should take into account the work of their counterpart agencies in the region.

The need for regulatory convergence is particularly important in establishing policies to promote competition. As competition becomes more of a regional and global phenomenon, competition policies based solely on national priorities could stifle new investments and obstruct the formation of strong regional companies. Thus, when making decisions regarding mergers, acquisitions and asset swaps, it is important that government agents think of competition on a regional basis, much as the Brazilian and Argentine governments did during the recent asset swap between Petrobras and Repsol-YPF.

Clearly, there is a need for some kind of regional agency to organize a coordinated public intervention in the energy sector concerning especially the planning and regulation activities in the region´s energy sector. In a word, what is needed is a Secretary of Energy for Mercosur. Mercosur´s current institutional diversity makes very difficult coordination of energy planning and regulation among the member countries. These limitations, obviously, must be removed if the Southern Cone countries intend to promote some kind of meaningful energy integration.

Although Mercosur prohibits the creation of organisms with supranational decision-making power, it is possible to create a communal institution based on voluntary negotiation between the countries. Various activities can contribute to policy coordination and regulatory decisions, such as:

- consolidation of information and further research on the energy industry in the Mercosur countries;
- completion of studies concerning the potential of energy integration;
- technical support for the development of an expansion plan for the various energy sectors of the region;
- creation of a forum for countries to negotiate the expansion plans;
- creation of a forum promoting cooperation among the regulatory organs of the region;
- technical support for international negotiations between businesses and governments involved in international energy projects;
- creation of a negotiating forum for the businesses and governments involved in international projects.

One of the most important drivers for private sector growth is innovation in all dimensions of the business (managerial, technological, contractual and commercial). Traditionally, international gas trade has been anchored by long-term contracts with take-or-pay and ship-or-pay clauses. As mentioned above, such contracts are intended to guarantee cash flows for the shipper and

transporter, facilitating supply-side investments. The buyers, on the other hand, often local gas distribution companies, face competition from substitute fuels (operating according to a netback price system), and thus must adjust prices in accordance with the variations in the price of their competitors.

This traditional pattern of transactions conflicts with the basic economic context of the Southern Cone, and South America in general. Price liberalization has caused fuel prices to fluctuate dramatically, requiring frequent adjustments of final gas prices as well. Furthermore, exchange rate variations also require changes in final gas prices. This has made the system of long-term contracts burdensome for gas distributors.

Given this situation, the role of the global players present in the Southern Cone gas industry is to search for contractual innovations that make their investments sustainable. The recent history of gas and electricity markets in Brazil and Argentina has shown that conventional contracts are not compatible with economic conditions in the region. Though long-term contracts, established in dollars and with take-or-pay clauses, mitigate risk for the seller, they elevate risk and often costs for the buyer. This makes it difficult for the latter to displace other fuels, depriving both buyers and sellers the market necessary to fulfill the terms of the contract. Given the political and institutional instability of the region, passing the buyer and seller risks on to governments is not an option. The only sustainable solution is the adoption of contractual innovations. These innovations should emphasize reducing the volatility of final gas prices. One option is to index gas prices to a basket of currencies from within the region, rather than indexing prices to the dollar. Another option would be to index gas to electricity prices and/or the price of fuels that compete with natural gas.

5 - Conclusions

This paper has analyzed the main driving forces and obstacles for gas industry integration in the Southern Cone. We have shown that there is a large potential for cross-border gas trade as a result of the complementarities of gas demand and supply between the different countries of the region. In addition, an important infrastructure of international transmission pipelines is already in place. Though several of these pipelines are currently operating below their maximum transportation capacity, this shows that there is potential for increasing the gas trade simply by taking advantage of the existing transmission infrastructure alone.

The reforms introduced into the Southern Cone’s energy markets represent a favorable step towards a more integrated energy market. First of all, the energy sector reforms have attracted international energy companies to the region. These companies are capable of leveraging the infrastructure investments necessary for the expansion of cross-border energy trade. Additionally, the technological convergence between the gas and electricity markets (through the development of combined-cycle gas turbines) has created an opportunity for monetising gas reserves in the electricity markets, increasing the potential markets for natural gas in Brazil, Chile and Uruguay.

Though impressive, the driving factors mentioned above seem insufficient to burst the cross-border gas trade in the region to its full potential. Several risks inherent to the NGI are inflated by the economic and institutional contexts of the Southern Cone. This article has put in evidence three of these obstacles: i) the macro-economic instability in the region, especially the exchange rate volatility; ii) the lack of a coordinated energy policy for the region; iii) and the regulatory

asymmetries in the energy sector. The paper has shown that these obstacles make long-terms gas contracts, necessary to anchor investments in the transmission infrastructure, extremely risky.

The paper also addressed how governments and companies can mitigate risks for cross-border gas trade. We call attention to the role of governments in building a more stable economic and institutional context for regional gas trade, mainly by coordinating energy policy and reducing regulatory asymmetries. In order to do so, there is a need for some kind of regional agency to organize the various projects in the region and coordinate planning and regulation in the region´s energy sector. The creation of a Secretary of Energy for Mercosur would be an important step to improve the coordination of energy planning and regulation among the member countries.

Concerning the role of the private sector, we argued that global players present in the Southern Cone gas industry should search for contractual innovations that make their investments sustainable. Examples of such innovation would be the indexation of contracts to prices and currencies from within the region. We suggested that rather than indexing prices to the dollar, final gas prices should be tied to a basket of currencies from the Southern Cone. Another option would be to index natural gas to electricity prices and/or the price of fuels that compete with natural gas. Therefore, given the level of fuel price and exchange rate volatility in the region, companies should focus their commercial strategies on creating more flexible contracts.

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